ARITHMETIC PROGRESSION

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1.) Find the 15th term of the AP 3, 9, 15, 21, ..?

$a = 3$ $\quad n = 15$

$d = 6$

$15^{th} = ?$

$T_n = a + (n-1)d$

$T_{15} = a + (15-1)d$

$= 3 + 14(6)$

$= 3 + 84$

$T_{15} = 87.$

2.) Find the general term of the AP $-3, -1/2, 2, \ldots$

$a = -3$ $\quad n = n$

$d = 2.5$

$T_n = a + (n-1)d$

$T_n = -3 + (n-1)2.5$

$= -3 + (2.5n - 2.5)$

$T_n = -5.5 + 2.5n$ (or) $2.5n - 5.5$ (or) $\frac{5n}{2} - \frac{11}{2}$

3) Find the sum of the first 10 numbers of the AP 1, 11, 21, 31, ...

$n = 10$

$a = 1$

$d = 10$

$S_n = \frac{n}{2}[2a + (n-1)d]$

$S_{10} = \frac{10}{2}[2(1) + (10-1)10]$

$= 5[2 + 90]$

$= 5[92]$

$S_{10} = 460$

4.) If 11th term is 47 and first term is 7 what is the common difference between them

$T_n = a + (n-1)d$

1st term $\Rightarrow$ $a = 7$

11th term $\Rightarrow$ $47 = a + (11-1)d$

$47 = 7 + (10)d$

$40 = 10d$

$d = 4$

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5.) Find out the sum of this sequence 10, 15, 20, 25, 30, ... 100.

$a = 10$
$d = 5$
$L = 100$

$$S_n = \frac{n}{2}(a+l)$$

$$n = \frac{L-a}{d} + 1$$

$$n = \frac{100-10}{5} + 1$$

$$n = \frac{90}{5} + 1$$

$$n = 19$$

$$S_{19} = \frac{19}{2}[10+100]$$

$$S_{19} = \frac{19}{2}[110]$$

$$S_{19} = 19 \times 55 = 1045$$

6.) The sum of the first 3 terms in an AP is 6. And that of the last 3 terms is 16. If the AP has a total of 13 terms, what is the sum of the middle three terms.

$n = 13 = a + 12d$

1st 3 term $\Rightarrow a + a+d + a+2d \Rightarrow 3a+3d = 6$

last 3 term $\Rightarrow a+12d + a+11d + a+10d \Rightarrow 3a+33d = 16$

$3d + 3d = 6$
$3a + 33d = 16$
$-30d = -10$

$$d = \frac{1}{3}$$

$3a + 3 \times \frac{1}{3} = 6$

$3a = 5$

$$a = \frac{5}{3}$$

Middle elements

$$\frac{n}{2} = \frac{13}{2} = 6.5 \Rightarrow$$

3 element $\Rightarrow$ $6^{th} + 7^{th} + 8^{th} = 3a + 18d$

$a+5d + a+6d + a+7d$

$$= 3\left(\frac{5}{3}\right) + 18\left(\frac{1}{3}\right)$$

$= 5 + 6$

Sum of middle elements $= 11$

A.P. WORD PROBLEM

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1) The 10^{th} and 18^{th} term of an A.P are 41 and 73 respectively Find 26^{th} term

$10^{th} \Rightarrow a+9d = 41$

$18^{th} \Rightarrow a+17d = 73$

$26^{th} \Rightarrow a+25d \Rightarrow$

$5+25(4)$

$26^{th} \Rightarrow 105$

$a+9d = 41$

$a+17d = 73$

$8d = 32$

$d = 4$

$a+9(4) = 41$

$a+36 = 41$

$a = 5$

2) If an A.P consists of n terms with first term 'a' and n^{th} term 'L' show that the sum of the n^{th} term from the beginning and the m^{th} term from the end is $(a+L)$

m^{th} term from last $= (n-m+1)$ from start

Sum of m^{th} term: $a_m + a_{n-m+1}$

$= a+(m-1)d + a+(n-m+1-1)d$

$= 2a(m-1+n-m)d$

$= a + a+(n-1)d$

$= a + a_n$

Sum of m^{th} term $= a+L$

$\therefore$ Hence proved

3.) Find the second term and n^{th} term of an A.P whose 6^{th} term is 12 and the 8^{th} term is 22.

$6^{th} \Rightarrow a+5d = 12$

$8^{th} \Rightarrow a+7d = 22$

$a+5d = 12$

$a+7d = 22$

$-2d = -10$

$d = 5$

$a+5(5) = 12$

$a+25 = 12$

$a = -13$

2^{nd} term $\Rightarrow a+d \Rightarrow 5+(-13)$

2^{nd} term $= -8$

n^{th} term $= a+(n-1)d$

$= -13+(n-1)5$

$= -13+5n-5$

n^{th} term $= 5n-18$

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4.) If the n^{th} term of the A.P 9, 7, 5, ... is as the n^{th} term of the AP 15, 12, 9, ... find n?

n^{th} term for 9, 7, 5, ...

$9 + (n-1)(-2)$

$9 - 2n + 2$

$11 - 2n$

$T_n = a + (n-1)d$

n^{th} term for 15, 12, 9, ...

$15 + (n-1)(-3)$

$15 - 3n + 3$

$18 - 3n$

$11 - 2n = 18 - 3n$

$+7 = +n$

$n = 7$

5.) The n^{th} term of an A.P is $6n+11$. Find the common difference

Let us substitute $n = 1$ in $6n+11$

$6(1) + 11 \Rightarrow 6 + 11 = 17$

Again we Assume $n = 2$ in $6n+11$

$6(2) + 11 \Rightarrow 12 + 11 = 23$

Common difference = $23 - 17 = 6$.

SURDS AND INDICES

1.) $\dfrac{(1000)^7 \div 10^{18}}{((10)^3)^7 \div 10^{18}}$

$(10)^{21} \div 10^{18}$

$\dfrac{10^{21}}{10^{18}} \Rightarrow (10)^{21-18} \Rightarrow (10)^3 = 1000$

2.) $(0.04)^{-1.5}$

$(4 \times (10)^{-2})^{-3/2}$

$\left(\dfrac{4}{10}\right)^{-3/2} \Rightarrow \left(\dfrac{(2)^2}{(10)^2}\right)^{-3/2} \Rightarrow \dfrac{2^{-3}}{10^{-3}} \Rightarrow \dfrac{10^3}{2^3}$

$\Rightarrow \dfrac{1000}{8}$

$= 125.$

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3) $49 \times 49 \times 49 \times 49 = 7^?$

$7^2 \times 7^2 \times 7^2 \times 7^2 \Rightarrow (7)^8$

$\Rightarrow 7^{16}$

$a^m \times a^n \times a^o \times a^p = a^{m+n+o+p}$

$\therefore$ 8 is ANSWER

4) $(64)^{-1/2} - (-32)^{-4/5} = ?$

$\left(\frac{1}{64}\right)^{1/2} - \left(\frac{-1}{32}\right)^{4/5}$

$\left(\frac{1}{64}\right)^{1/2} - \left(\frac{1}{32}\right)^{4/5}$

$\left(\frac{1}{8^2}\right)^{1/2} - \left(\frac{1}{2^5}\right)^{4/5}$

$\frac{1}{(8)^1} - \frac{1}{(2)^4}$

$\frac{1}{8} - \frac{1}{16}$

$= \frac{1}{16}$

~~5) if $\sqrt{5^?} = 64$ then ?~~

5) $\dfrac{(25)^{7.5} \times (5)^{2.5}}{(5^2)^{7.5} \times (5)^{2.5}} \div (125)^{1.5} = 5^?$

$(5^3)^{1.5}$

$= \dfrac{(5)^{15} \times (5)^{2.5}}{(5)^{4.5}}$

$= (5)^{15+2.5-4.5}$

$= (5)^{13}$

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6) if $\sqrt{2^n} = 64$ then n value is

$$2^{n/2} = 2^6$$

$$n/2 = 6$$

$$n = 12$$